

THURSDAY, FEBRUARY 2, 1882

SCIENTIFIC WORTHIES

XIX.—ADOLF ERIK NORDENSKJÖLD

FEW men have done more varied and real service for science than Baron Nordenskjöld, whose portrait we are pleased to include in our Gallery of Scientific Worthies. The present seems an appropriate time to do so, when Nordenskjöld has crowned the labours of half a lifetime by recounting the story of his greatest achievement, and put the finishing touch to centuries of effort. Baron Nordenskjöld is known to most as the successful Arctic explorer and navigator, but his claims to be regarded as a worthy of science rest on a much wider basis.

Adolf Erik Nordenskjöld was born at Helsingfors, the capital of Finland, on November 18, 1832, the third in order of seven children, four brothers and three sisters, all of whom, with the exception of a sister who died young, still survive. His parents were Nils Gustaf Nordenskjöld, a well-known naturalist, chief of the mining department of Finland, and Margareta Sofia von Haartman. The race from which Nordenskjöld sprang had been known for centuries for the possession of remarkable qualities, among which an ardent love of nature and of scientific research was predominant. Its founder is said to have been a Lieut. Nordberg, who was settled in Upland about the beginning of the seventeenth century. His son, Johan Erik, born 1660, changed the name to Nordenberg. He died in 1740, leaving two sons, Anders Johan and Carl Frederik, both of whom, though the latter was only lieutenant, were elected members of the Swedish Academy of Sciences when it was founded in 1739. Both were ennobled in 1751. Carl Frederik is the common ancestor of the families bearing the name of Nordenskjöld now living in Sweden and Finland. One of his many remarkable sons, the third in order, Col. Adolf Gustaf Nordenskjöld, became owner of Frugord in Finland. This property, situated in a forest-crowned valley in the department of Nyland, is still in the possession of the Nordenskjölds. Here Col. Adolf Gustaf Nordenskjöld built a peculiar residence, the middle of which is taken up with a hall two stories high, round the upper part of which runs a broad gallery in which collections in natural history are arranged. His youngest son, Nils Gustaf, was born in 1792. After passing his examination in mining at the University of Upsala he was for several years a pupil of Berzelius, with whom he formed the warmest friendship, which was only broken off by death. Nils Gustaf, early known as a distinguished mineralogist, was appointed a government inspector of mines in his native country, and by means of liberal grants of public money was enabled to undertake extensive foreign tours, which brought him into communication with most of the eminent mineralogists and chemists of the day in England, France, and Germany. After three years of foreign travel he returned to Finland, and was promoted in 1824 to be chief of the mining department, and devoted thirty years of restless activity to the improvement of that important branch of the industry of his native land. He travelled through Finland in all directions in the prosecu-

tion of his untiring mineralogical and geological researches. His travels extended as far as the Ural. He published his views, discoveries, and experiments, in many scientific periodicals and in several independent works, and a large number of minerals discovered by him afford evidence of his keen research. He was made Councillor of State, and obtained many distinctions for his scientific services from the sovereign and from learned bodies. On February 21, 1866, he ended his active life at Frugord, and was laid to rest in his father's grave.

Adolf Erik while yet a boy was an industrious collector of minerals and of insects, and was permitted to accompany his father on his tours, acquiring thus early the keen eye of the mineralogist. After studying for some time with a private tutor he was sent to the gymnasium at Borgo, where, as at similar institutions elsewhere, there then prevailed, as he tells us in the autobiographical sketch which he wrote for Bejer's "Swedish Biographical Lexicon," an almost unlimited freedom, the teachers taking no oversight whatever of the pupils' attention to their studies.

Nordenskjöld entered the University of Helsingfors in 1849, devoting himself chiefly to the study of chemistry, natural history, mathematics, physics, and above all, of mineralogy and geology. "Already, before I became a student," he writes, "I had been allowed to accompany my father in mineralogical excursions, and had acquired from him skill in recognising and collecting minerals and in the use of the blowpipe, which he, being a pupil of Gahn and Berzelius, handled with a masterly skill unknown to most of the chemists of the present day. I now undertook the charge of the rich mineral collection at Frugord, and besides, during the vacations made excursions to Pitkeranta, Tammela, Pargas, and others of Finland's interesting mineral localities. By practice I thus acquired a keen and certain eye for recognising minerals, which has been of great service to me in the path of life I afterwards followed."

After passing his candidate examination in 1853, Nordenskjöld accompanied his father on a mineralogical tour to Ural devoting most of his attention to Demidoff's iron and copper mines at Tagilsk. Here he planned an extensive journey through Siberia, but the breaking out of the Crimean war put a stop to it.

"After my return," says Nordenskjöld, "I continued to prosecute my chemical and mineralogical studies with zeal, and wrote as my dissertation for the degree of Licentiate a paper 'On the Crystalline Forms of Graphite and Chondrodite,' which was discussed under the presidency of Prof. Arppe on the 28th of February, 1855. The following summer I was employed on a work of somewhat greater extent—'A Description of the Minerals found in Finland,' which was published the same autumn. Various short papers in mineralogy and molecular chemistry were printed in *Acta Societatis scientiarum Fenniae*: I also published, along with Dr. E. Nylander, 'The Mollusca of Finland' (Helsingfors, 1856), as an answer to a prize question proposed by one of the faculty. In the interval I had been appointed Curator of the Mathematico-Physical faculty, and had obtained a post at the Mining Office as mining engineer extraordinary, with inconsiderable pay, and an express understanding that no service would be required from me in return. A salary was also attached to my curatorship."

Nordenskjöld, however, did not long hold these appointments, having incurred the wrath of von Berg, the governor of Finland, for being present at a dinner at which, with the thoughtlessness of youth, there was some liberal talk and free singing. This was in November 1855, and Nordenskjöld resolved to take advantage of his rustication to travel. He went to Berlin, where he stayed during the spring and early summer of 1854, working in Rose's laboratory at researches in mineral analysis. Returning to Finland the same year, he had hoped to obtain a travelling scholarship, meaning to devote himself to Siberia, but was disappointed. He, however, obtained a stipend for a line of study through Europe in 1857. Before leaving he attended the Promotion Festival of that year, where he was to take his Master's and Doctor's degrees. At the Festival there was more liberal talk, which von Berg construed into "high treason," and Nordenskjöld thought it advisable to leave Finland for a time. He crossed over to Sweden, where he ultimately became naturalised, and rose to eminence both in public life and as a worker in science. Since 1862, however, Nordenskjöld had been allowed to go to Finland as often as he pleased, and would have been, in 1867, appointed Professor of Mineralogy in the University of Helsingfors, had he been able to promise to abjure politics, which he could not do entirely. By this time (July 1, 1863) he had married a Finnish lady (Anna Mannesheim, daughter of ex-President Count Carl Mannesheim). In 1858 Nordenskjöld took part in the first expedition to Spitzbergen, organised by Sorell, the head of the Swedish Geological Survey. To these and other voyages of Nordenskjöld we referred at some length in vol. xx. pp. 606, 631, and further details will be found in Mr. Leslie's "Arctic Voyage of A. E. Nordenskjöld," published by Macmillan and Co. in 1879, to which we are mainly indebted for the details of the present article. On his return from this voyage in the autumn of 1858 Nordenskjöld was appointed successor to Mosander in the Mineralogical department of the Riks Museum at Stockholm. Meantime he had been engaged mainly in the practical study of the mineralogy of Scandinavia.

"Immediately after my return to Stockholm I entered on my new employment and began to work partly at the arrangement of the museum, partly at scientific researches which formed the subjects of several of my papers published either in the Transactions of the Academy of Sciences or of the Geological Society. At Prof. Mosander's death, when the rebuilding of the Academy's house had just begun, the mineralogical collection was stuffed into three small rooms, where there was so little space that the exhibition of the collection could not be thought of. The new spacious apartments intended for the Riks Museum were finished in the summer of 1865, and already by the following autumn the arrangement and removal of the collections were so far advanced that the Museum could be opened to the public. It has since been my constant endeavour to enlarge the collection not only by purchases from dealers in minerals, but mainly by visits to the most important mineral localities in Scandinavia, undertaken on account of the Museum, partly by the Intendent himself, partly by Assistant Lindström, or by students of mineralogy from the Universities. In consequence of the extraordinary richness of the Scandinavian peninsula in rare and remarkable minerals, the Mineralogical Museum at Stockholm, with the help of the collections, valuable in certain directions, which have existed

from Mosander's time, has in this way become one of the most considerable in Europe."

Nordenskjöld still continued to travel in search of minerals through various parts of Sweden and Norway. In 1861 he took part in another expedition to Spitzbergen under Torell, and in December, 1862, he crossed on the ice from Sweden to Finland, in order to make some investigations on the formation of sea-ice. In 1864 another expedition was made to Spitzbergen in connection with the measurement of an arc of meridian, and in the following year he was busy with further mineralogical investigations both in Sweden and Finland. In 1867 an agreeable change came in the form of a visit to Paris in connection with the Metric Commission, and the Exhibition of that year gave Nordenskjöld an opportunity of making the acquaintance of many eminent men of science. In the summer of 1868 Nordenskjöld found himself at the head of an expedition on a much larger scale than any of his previous ones, and partly fitted out at the Government expense. Rich and important scientific collections were brought home, and they reached the highest northern latitude which any vessel could be proved to have attained in the old hemisphere at that time. Among the contributors to this expedition was Mr. Oscar Dickson of Gothenburg, whose name is inseparably connected with Nordenskjöld's Arctic researches, and who has continued ever since to contribute to his expeditions with unprecedented liberality. Mr. Dickson, as is evident from his name, is of British origin, his father having been a native of Scotland who many years ago settled in Sweden. Previous to and preparatory for his next expedition, Nordenskjöld in 1870 visited Greenland, in company with Dr. Berggren, with results of the greatest value; some of which he refers to as follows:—

"The collection of new contributions to the flora of the Polar countries during several preceding geological periods of special importance for a knowledge of the history of the development of our globe. The discovery in the Miocene basaltic strata of Greenland at Ovivak, on the island Diskö, of the largest known blocks of meteoric iron, regarding the origin of which an extensive scientific controversy has arisen, and which perhaps will at some future time form the starting point for quite a new theory of the method of formation of the heavenly body we inhabit. The large blocks were brought home the following year by two vessels of war which were sent out to Greenland for that purpose by the Swedish Government, under the command of Baron von Otter.

"An excursion of some length was made into the wilderness of ice, everywhere full of bottomless clefts, which occupies the interior of Greenland, and which, if I except unimportant wanderings along the edge and an inconsiderable attempt in the same direction in the year 1728, by the Dane Dalager, was now, for the first time, trodden by human foot. I had here an opportunity of clearing up the nature of a formation which, during one of the latest geological ages, covered a great part of the civilised countries of Europe, and which, though it has given occasion to an exceedingly comprehensive literature in all cultivated languages, *had never before been examined by any geologist*. The equipment for the journey was exceedingly defective, because everybody with whom I conversed who had any knowledge of the circumstances, declared to me that such a journey was impracticable, and that in consequence my preparations were thrown away. It was on this account that I was compelled to return earlier than would otherwise have been the case."

One object of Nordenskjöld's going to Greenland was to discover whether dogs could be used in Spitzbergen for extensive sledge journeys, with the result that he found that they could not be employed "in long sledge journeys in the regions where no game was to be had."

Nordenskjöld had not ceased to take an interest in public affairs, and represented the capital of Sweden in the Diet for 1869 to 1871, during which he managed to bring about some important legislative measures for the better promotion of science. In the Spitzbergen Expedition of 1872-73 Nordenskjöld spent the winter in Mussel Bay, the state of the ice having been in an unusually unfavourable condition. Among the results of the expedition Nordenskjöld mentions the following:—

"The discovery on the Polar-ice itself of a dust of cosmic origin, containing metallic nickel-iron; researches by Dr. Kjellman on the development of algæ during the winter night, which at Mussel Bay is four months long; researches on the Aurora and its spectrum by Dr. Wijkander and Lieut. Parent, of the Italian Marine; researches by Dr. Wijkander on horizontal refraction in severe cold; a complete series of meteorological and magnetic observations in the most northerly latitude where such observations had up to this time been carried on; the discovery of numerous new contributions to a knowledge of the flora of the Polar countries during former geological epochs; a sledge excursion undertaken under very different circumstances by Palander and myself, whereby the north part of North East Land was surveyed, and a journey, very instructive in a scientific point of view, made over the inland ice of North East Land, &c., &c."

Then, in 1875, followed the expedition to the mouths of the Yennissei and Obi, the first of a series which culminated in the circumnavigation of Europe and Asia, of which we have just had such a full and instructive narrative.

Thus no one man has done half so much as Baron Nordenskjöld for a scientific exploration of the Arctic regions. The most striking characteristics of his various expeditions have been the small expense at which they were conducted, their modest but carefully-considered equipment, the clear and scientific methods on which they were planned, and the wealth and high value of the results obtained. In the intervals between the expeditions, Nordenskjöld was by no means idle. Not only was he occupied with his official duties as chief of the Stockholm Museum, but his researches in mineralogy, on the origin and constitution of meteors, on auroræ, and, in other important departments, are of the greatest moment. In 1876 he took part as a commissioner in the Philadelphia Exhibition; when he returned on July 1 of that year he stepped on board the vessel that was to take him on his second expedition to the Yennissei. We give the first of two articles on his researches on Auroræ, and hope shortly to give some account of his work in connection with Meteors.

As to the personal character of Baron Nordenskjöld we need say little, his modesty and geniality and his aversion to public display are well-known. He has in his adopted country risen to the highest honours, and as a well-earned reward for the success of his last expedition, the King of Sweden, his warm supporter, conferred on him the title of Baron. From scientific societies all over the world he has received honours. He is only yet in his prime; and is now preparing for another expedition to the

shores of Siberia, and we trust he may long be spared to carry on the work in which it would be difficult to find a successor.

THE POSSIBILITY OF FINDING WORKABLE COAL-SEAMS UNDER THE LONDON AREA

IN a lecture recently delivered at the London Institution, an attempt was made to lay before a popular audience the course of reasoning, by which geologists have demonstrated that productive Coal-Measures may not improbably lie at no great depth beneath the metropolitan districts. The verification of the prediction that a ridge of Palæozoic rocks would be found to extend at a moderate depth beneath London, which has resulted from the borings made by Messrs. Meux and Co. in the Tottenham Court Road, and by the New River Company at Turnford and Ware, has renewed the interest which geologists have long taken in the question; and as the people of the metropolis now pay something like £5,000,000 a year for the carriage of coal from a distance, it appeared to be not unlikely that the general public might also be brought to take an intelligent interest in this important problem.

The discussion of the subject which has since taken place in the newspapers shows that such an expectation was not altogether unreasonable. But it must at the same time be confessed that some of the writers who have dealt with the subject have shown such a total misapprehension of the true nature of the problem, as to render it advisable to give in the pages of NATURE some explanations of the positions taken up by geologists in connection with the whole question.

As long ago as the year 1826, Dr. Buckland and Mr. Conybeare, in describing the features of the Bristol and Somerset coalfield, took occasion to point out how closely the Coal-Measures of that district resemble those of the great Belgian coalfield. This resemblance can be traced not only in the nature and succession of the strata in the two coalfields, but also in their positions and relations.

In the year 1841 MM. E. de Beaumont and Dufrenoy called attention to the fact that coal had been followed under newer beds in the North of France, and that possibly the same ridge of old rocks with coal-strata might stretch right away under the south-eastern counties of England.

In 1846 Sir Henry de la Beche gave much greater precision to the suggestion, and wrote as follows:—"From the movement of the older rocks many a mass of Coal-Measures may be buried beneath the Oolites and Cretaceous rocks on the east (of the Bristol Coalfield), connecting that district with those of Central England and Belgium, rolled about and partially denuded prior to the deposition of the New Red Sandstone."

In 1852 M. Meugy pointed out that it was by no means improbable that the coal basins of Belgium and Northern France would be found to extend right under the London basin.

But it is to Mr. Godwin-Austen that we are indebted for the most complete and philosophical discussion of the whole problem. In his well-known paper read before the Geological Society in 1855, he showed that the Coal-Measures, which had been proved to thin out under the